

## Introduction

Army installations represent a large, long-term investment in infrastructure and personnel critical to sustaining military readiness and power projection. Over the past few years, however, many Army installations have had to adjust or constrain their mission activities because of “outside-the-fence-line” conflicts. Noise, safety, dust, air and ground traffic, water and air quality, and water supply have surfaced as concerns by communities that are rapidly “encroaching” on our military assets. Often when communities express these concerns, installations make adjustments such as the following: ranges are moved away from boundaries; air traffic hours and zones of operation are reduced; bombing ranges are moved or even shut down; and night operations are reduced or eliminated (despite the need for troops to be ready to support night firing in theater situations). Cumulatively, these seemingly small adjustments are taking a toll on Army mission readiness.

Significant media attention has been devoted to urban and suburban growth that impacts the sustainable use of military facilities. In 1999, the California legislature passed the Defense Retention and Conversion Council Act, in part to facilitate planning interactions between communities and military installations. In 2000, the Senior Readiness Oversight Council (SROC), the senior mission readiness planners for the military Services, identified several specific encroachment concerns that affect DOD operations:

- Threatened and endangered species habitat protection,
- Urban and suburban growth near installations,
- Increased competition for electromagnetic frequencies,
- Airspace conflicts,

# TECHNOLOGIES TO HELP INSTALLATIONS PLAN ACROSS FENCE LINES

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- Protection of marine mammals and potential impacts of mission-related underwater noise,
  - Unexploded ordnance dangers,
  - Air quality,
  - Weapon and air traffic noise,
- and
- Community interaction.

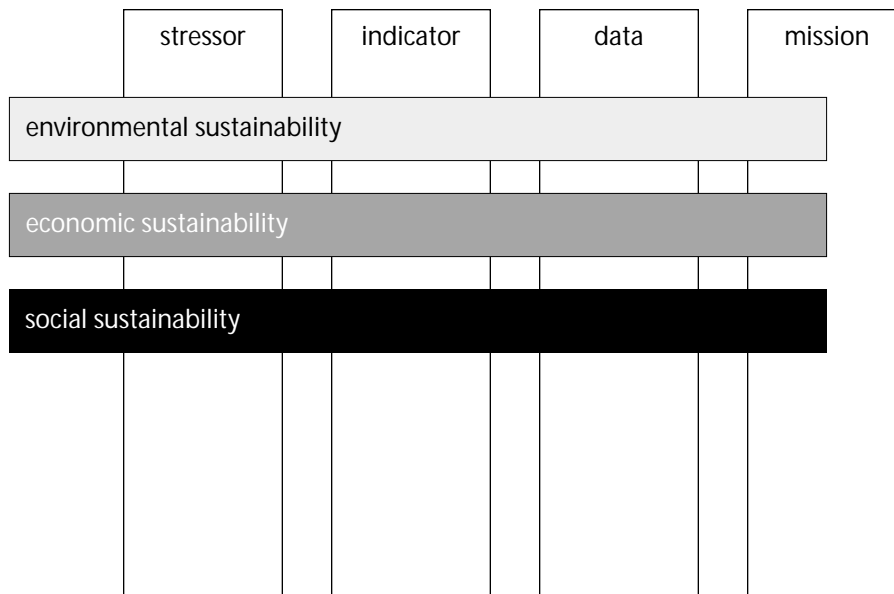
These concerns reflect the types of issues that potentially limit military installation operations. The issues may stem from public laws that protect habitats within installation boundaries or from activities that occur outside the installation boundaries but affect mission activities (e.g., use of protected frequencies or conflicts between civilian and military air flight routes). Whether military mission constraints result from legislated protection of on-post resources or from concerns about the impact of noise, dust, and fire on neighboring communities, the combined impact of these issues has significantly reduced military training and testing operations on military lands. Yet our forces must conduct

sufficient testing and training to maintain readiness. We must begin to proactively protect our current training and testing facilities.

## Sustainable Planning

Traditionally, installations have planned for facilities and activities within their fence lines without extensive coordination of plans with surrounding communities. Recent guidance from DOD (*Sustainable Planning: A Multi-Service Assessment*, 1999) concludes that sustainable development is most successful when military and civilian communities cooperate to leverage resources and avoid and mitigate conflicts.

The Army and other Services encourage collaborative planning and revise planning guidelines and regulations to reflect a stronger focus on sustainable planning, which includes joint planning between communities and installations. To successfully accomplish joint planning, installations and communities need access to accurate data, successful planning techniques,



*The SRA System*

scenario analysis tools, planning experts, and the knowledge retained from others who have undertaken similar efforts. These requirements are the focus of the sustainability, encroachment and room to maneuver (SERM) technology initiative of the Engineer Research and Development Center (ERDC) Construction Engineering Research Laboratory (CERL) in Champaign, IL. This technology initiative represents a “lands analysis” component of the Fort Future capability discussed in the May-June 2002 issue of *Army AL&T*.

## Technology Requirements

What technologies facilitate joint planning between installations and communities? Key requirements include:

- The ability to understand past trends and to project these trends and additional “plans” into possible future scenarios;
- An improved understanding of the relationships between community actions (e.g., zoning approval for new subdivisions near installation boundaries) and potentially affected

military operations (e.g., range operations or air flight routes);

- An improved ability to identify, analyze, portray, and project the requirements for and condition of transportation resources (rail, air, road, and port) that have joint use by communities and installations;
- Easily accessible data sources and techniques to acquire, review, portray, and analyze data relevant to land and airspace uses, and other relevant resources, both within and beyond installation boundaries; and
- Easy access to mitigation approaches and “lessons learned” from other installations and communities addressing joint planning challenges.

In addition to these installation-specific requirements, the military Services need to understand relative “risk” to mission activities across all their installations. These risks include the cumulative impact across multiple installations that support specific mission activities (e.g., the combined risk to the multiple installations that provide facilities for weapon testing) or multiple installations in certain regions.

## Technology Solutions

The goal of sustainable planning involves developing capabilities that focus these requirements into a manageable decision support tool. The effort focuses on providing technologies to help military planners at multiple levels address across-the-fence-line sustainability and planning issues. The organizing principal of the sustainable planning effort involves sustaining a military installation’s mission by determining and ultimately mitigating its environmental, social, and economic risks. The process includes assessing risks associated with the sustainability of the economic, environmental, and social systems in the area; analyzing the change-inducing policies and drivers for input into a spatial and dynamic modeling environment to discover “what-if” land-use change scenarios or alternatives; and assessing the effect of those scenarios to determine the plans and policies needed to implement the most desirable scenario.

This effort has resulted in several useful resources such as historic trends analysis and protocols; an assessment of risks; spatial and dynamic modeling; and impact assessments within a military land-use planning model. Each is described in more detail below.

## Trends And Protocols

Urban growth maps are effective visual aids that highlight historic trends that can be a source of conflict and threat to continued training activities on military lands. A historic urban growth series is composed of cartographic illustrations that depict the changes in land use around an installation. This visual presentation quickly conveys the potential for conflicts as the separation between military lands and the neighboring community disappears. Trend analysis is a powerful tool for

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showing the changing conditions around an installation.

### **Risk Assessment**

The primary goal of this research was to identify and evaluate risks to military lands resulting from exogenous effects of local area economic and physical growth. Demographic, economic, and land-use data were gathered and examined as potential risk indicators. Several data summarization levels and spatial scales were evaluated to determine if different risk assessments might be derived, and to suggest monitoring approaches for continuing assessment.

A product of this work is the development of the sustainability risk assessment (SRA) tool. SRA is a systematic, objective, and hierarchical approach to measuring the risks to military installations. It is an objective approach because it draws on national, regional, and local installation spatial data. SRA is used to examine these spatial hierarchies using environmental, social, and economic domains as organizers. (See figure on Page 33.) Indicators based on metrics within the hierarchies are then developed around factors such as land, energy, and water within the domains.

### **Spatial And Dynamic Modeling**

The military land-use and impact assessment model (mLEAM) is a simulation modeling environment that describes land-use changes across a landscape (inside and outside the installation fence line). These

changes result from the spatial and dynamic interaction among economic, ecological, social, and control systems in the region.

The mLEAM uses a spatial modeling approach to illustrate the drivers of land-use change and the associated environmental, economic, and social impacts of the modeled changes. This approach is important in developing policy scenarios that can help mitigate the conflicts between inside- and outside-the-fence-line interests.

Associated with the visualization of probable land-use changes is the "So what?" question. What do modeled scenario results mean? By using the results of the mLEAM Model scenarios and a sensitivity analysis, researchers can develop a dynamic factor analysis of SROC criteria that captures the impact indices related to installation/community interactions. This methodology enables critical analysis of each policy scenario for its overall environmental impact.

### **Status**

The tools discussed in this article are under development at ERDC-CERL, while the alpha application of the tools is underway at Fort Benning, GA. Initial analysis suggests that encroaching community development is beginning to impact Benning in the following ways: There are demands for threatened and endangered species protection, reduced military economic impacts in the region, and physical land-use changes at the border. The analysis

will help improve the mission viability of Fort Benning by uncovering the potential conflicts with neighboring community development plans.

### **Conclusion**

In the future, military installations will need to work closely with their surrounding communities to avoid and manage conflicts and to improve resource sharing. Installations and communities will also need to work together to "sustain" installation mission activities. The Army and the other Services are developing policies and guidance for installation managers to "plan across their fence lines." In cooperation with researchers in the other Services and agencies, ERDC is developing the tools, techniques, and data models to help address these complex across-the-fence-line planning and management requirements.

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